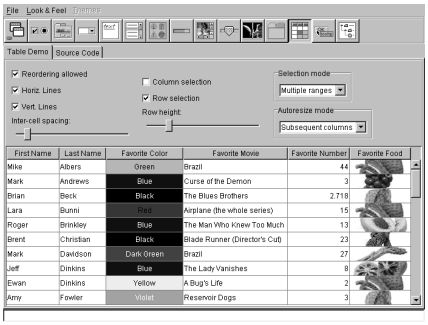
Basics of GUI

GUI ?



Support for GUI in Java

Support for GUI

- Abstract Windowing Toolkit (AWT) & Swing packages
  - Provides rich set of user interface components
  - java.awt & javax.swing
  - Old (AWT) VS. New(Swing)
- Components in awt & swing (start with J)
  - Frame, JFrame
  - Menu, JMenu
  - Button, JButton
  - TextField, JTextFiled
  - Label, JLabel
  - and many more….
- Use Java API Documentation well, its your FRIEND.

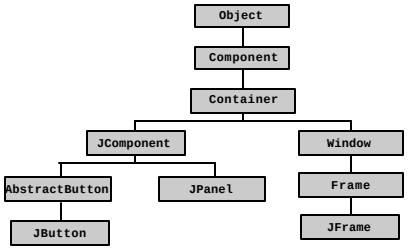
Abstract Windowing Toolkit

- AWT
  - The original GUI components
  - Referred as “Heavy Weight Components (HWC)”
    - Tied directly to the local platform’s GUI capabilities
  - Provides
    - robust event-handling model
    - Layout Managers

Swing

- Swing
  - Newest GUI components, Names start with J can be identified
  - “replacement” to the AWT
  - Referred as “Light Weight Components (LWC)”
    - Swing components are written, manipulated and displayed completely in java
    - So they are not “weighed down” by the GUI capabilities of local platform
  - Several Swing components are still HWC like JFrame etc.
  - Allows uniform “look & feel” across all platforms

A Part of the Framework



GUI Creation Steps

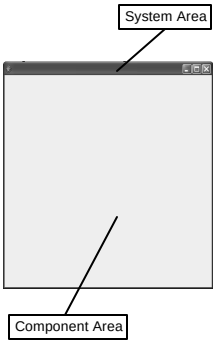
GUI Creation Steps

1. import required package
   - e.g. swing, awt
2. Setup the top level container
   - e.g. JFrame myframe = new JFrame();

GUI Creation Steps (cont.)

3. Get the component Area of the top level Container

```
Container c = myFrame.getContentPane();
```



GUI Creation Steps (cont.)

4. Apply layout to that Area
   - c.setLayout(new FlowLayout());
5. Create & add components
   - JButton b1 = new JButton("Hello");
   - c.add(b1);
6. Set size of Frame and make it Visible
   - myFrame.setSize(200,200);
   - myFrame.setVisible(true);

Example GUI

GUI: Example Code

```
//Step 1: import packages
import java.awt.*;
import javax.swing.*;

public class GUITest {
 JFrame myFrame ;
 JTextField tf;
 JButton b1;

public void initGUI ( ) {  //method used for setting layout of GUI
//Step 2: setup the top level container
    myFrame = new JFrame();

    //Step 3: Get the component area of top-level  container
    Container c = myFrame.getContentPane();
    //Step 4: Apply layouts
    c.setLayout( new FlowLayout( ) );
   ....
```

GUI: Example Code (cont.)

```
    //Step 5: create & add components
    JTextField tf = new JTextField(10);
    JButton b1 = new JButton("My Button");

    c.add(tf);
    c.add(b1);

   //Step 6: set size of frame and make it visible
   myFrame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
   myFrame.setSize(200,150);
    myFrame.setVisible(true);

  } //end init method

 public GUITest  () {  // constructor
       initGUI ();
  }
.........
```

GUI: Example Code (cont.)

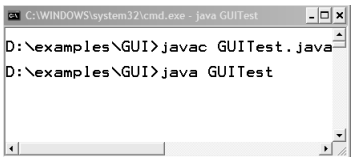
```
  public static void main (String args[ ]) {

     GUITest gui = new GUITest();

  }

} // end of class
```

Compile & Execute



GUI Creation Approaches

Composition

```
class GUITest{
  JFrame frame;
  Container c;
  public GUITest ( ) {
    frame = new JFrame ( );
    c = frame.getContentPane();
   ......
   frame.setVisible(true);
  }
  .........
}
```

Inheritance

```
class GUITest extends JFrame{

  Container c;
  public GUITest ( ) {

    c = getContentPane();
   ......
   setVisible(true);
  }
  .........
}
```

Layout Managers

Layout Managers

– The layout of components in a container is usually governed by layout managers

– Similar to HTML – policy, not position

- Do not set explicit pixel sizes or positions of things
- Layout Managers know the intent (policy)
- Layout Managers apply the intent to figure out the correct size on the fly

Layout Managers

- Layout Managers
  - Java supplies many layout managers. Five commonly used are:
    - FlowLayout
    - GridLayout
    - BorderLayout
    - BoxLayout
    - GridBagLayout

Layout Managers

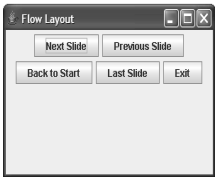
- Layout Managers
  - FlowLayout
    - Places components in a line as long as they fit, then starts the next line.
    - Uses "best judgement" in spacing components. Centers by default.
    - Lets each component assume its natural (preferred) size.
    - Often used for placing buttons on panels.

GUI: Example Code FlowLayout

```
 ....
 c.setLayout (new FlowLayout() );

 JButton b1 = new JButton("Next Slide");
 JButton b2 = new JButton("Previous Slide");
 JButton b3 = new JButton("Back to Start");
 JButton b4 = new JButton("Last Slide");
 JButton b5 = new JButton("Exit");

 c.add(b1);
 c.add(b2);
 c.add(b3);
 c.add(b4);
 c.add(b5);
                    size(300,200)
 }//end of main
}
```



Layout Managers

- Layout Managers
  - GridLayout
    - Splits the panel into a grid with given number of rows and columns.
    - Places components into the grid cells.
    - Forces the size of each component to occupy the whole cell.
    - Allows additional spacing between cells.

GUI: Example Code GridLayout

```
 ....
 c.setLayout (new GridLayout(3 , 2) );

 JButton b1 = new JButton("Next Slide");
 JButton b2 = new JButton("Previous Slide");
 JButton b3 = new JButton("Back to Start");
 JButton b4 = new JButton("Last Slide");
 JButton b5 = new JButton("Exit");

 c.add(b1);
 c.add(b2);
 c.add(b3);
 c.add(b4);
 c.add(b5);
 ......          size(200,200)

}
```

GUI: Example Code GridLayout

```
....
c.setLayout (new GridLayout(3 , 2, 10, 20 ) );

JButton b1 = new JButton("Next Slide");
JButton b2 = new JButton("Previous Slide");
JButton b3 = new JButton("Back to Start");
JButton b4 = new JButton("Last Slide");
JButton b5 = new JButton("Exit");

c.add(b1);
c.add(b2);
c.add(b3);
c.add(b4);
c.add(b5);
                size(200, 200)
}//end of main
}
```

Extra space between the cells

Layout Managers

- Layout Managers
  - BorderLayout
    - Divides the area into five regions
    - Adds a component to the specified region
    - Forces the size of each component to occupy the whole region.

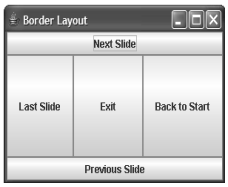
NORTH		
WEST	CENTER	EAST
SOUTH		

GUI: Example Code BorderLayout

```
....
c.setLayout (new BorderLayout( ) );

JButton b1 = new JButton("Next Slide");
JButton b2 = new JButton("Previous Slide");
JButton b3 = new JButton("Back to Start");
JButton b4 = new JButton("Last Slide");
JButton b5 = new JButton("Exit");

c.add(b1, BorderLayout.NORTH);
c.add(b2, BorderLayout.SOUTH);
c.add(b3, BorderLayout.EAST );
c.add(b4, BorderLayout.WEST );
c.add(b5, BorderLayout.CENTER);
}//end of main
}
```

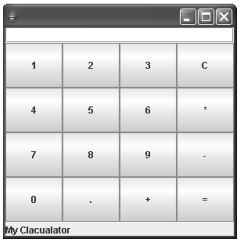


Layout Managers

- Layout Managers
  - Default Layouts
    - Each container has a default layout manager, which remains in effect until the component's setLayout method is called.
  - Some of the defaults are:
    - Content pane → BorderLayout
    - JPanel → FlowLayouts

Making Your own Calculator

Calculator GUI



Code: CalculatorGUI

```
import java.awt .*;
import javax.swing.*;

public class CalculatorGUI {

   JFrame fCalc;

   JButton b1, b2, b3, b4, b5, b6, b7, b8, b9, b0;
   JButton bPlus, bMinus, bMul, bPoint, bEqual, bClear;

   JPanel pButtons;

   JTextField tfAnswer;

   JLabel lMyCalc;
```

Code: CalculatorGUI (cont.)

```
public void initGUI ( ) {  //used for setting layout of calculator

      fCalc = new JFrame();

      b0  =  new JButton("0");
      b1  =  new JButton("1");
      b2  =  new JButton("2");
      b3  =  new JButton("3");
      b4  =  new JButton("4");
      b5  =  new JButton("5");
      b6  =  new JButton("6");
      b7  =  new JButton("7");
      b8  =  new JButton("8");
      b9  =  new JButton("9");

      bPlus    =  new JButton("+");
      bMinus  =  new JButton("-");
      bMul     =  new JButton("*");
      bPoint   =  new JButton(".");
      bEqual  =  new JButton("=");
      bClear   =  new JButton("C");

      // continue....
```

Code: CalculatorGUI (cont.)

```
      tfAnswer = new JTextField();

      lMyCalc = new JLabel("My Clacualator");

      //creating panel object and setting its layout
      pButtons= new JPanel (new GridLayout(4,4));


      //adding components (buttons) to panel
      pButtons.add(b1);
      pButtons.add(b2);
      pButtons.add(b3);
      pButtons.add(bClear);

      pButtons.add(b4);
      pButtons.add(b5);
      pButtons.add(b6);
      pButtons.add(bMul );

      //continue
```

Code: CalculatorGUI (cont.)

```
      pButtons.add(b7);
      pButtons.add(b8);
      pButtons.add(b9);
      pButtons.add(bMinus);

      pButtons.add(b0);
      pButtons.add(bPoint);
      pButtons.add(bPlus);
      pButtons.add(bEqual );

      Container con = fCalc.getContentPane( );
      con.setLayout(new  BorderLayout());

      //adding components to container
      con.add(tfAnswer, BorderLayout.NORTH) ;
      con.add(lMyCalc, BorderLayout.SOUTH);
      con.add(pButtons, BorderLayout.CENTER) ;

      fCalc.setSize(300, 300);
      fCalc.setVisible(true);

 } // end of initGUI  method
……..
```

Code: CalculatorGUI (cont.)

```
 //default constructor
  public CalculatorGUI ( ) {
      initGUI();
  }

  //main method
  public static void main(String args[ ]) {

      CalculatorGUI calGUI = new CalculatorGUI();
  }

} //end of class
```

More Swing Components

- JCheckBox
  - Note uppercase B (vs. Checkbox in AWT)
- JRadioButton
  - Use a ButtonGroup to link radio buttons
- JTextArea
  - Place in JScrollPane if you want scrolling
- JFileChooser

Swing Components

Top Level Containers

Your application usually extends one of these classes !

Swing Components

- General Purpose Containers